

Practice Board Exam Questions

Right Ventricle

Steven J. Lester MD, FACC, FRCP(C), FASE
Mayo Clinic, Arizona



1. In which scenario will applying the simplified Bernoulli equation to the peak tricuspid regurgitation velocity and adding an estimate of right atrial pressure likely not result in an under estimation the right ventricular systolic pressure.

- a. When there is pulmonary valve stenosis.**
- b. When there is severe tricuspid regurgitation**
- c. When there is marked dilation of the right ventricle**
- d. When you are unable to align the continuous wave Doppler signal parallel to the intercept angle of the axis of flow.**

Estimate of RVSP and PASP Assumptions

1. Velocity is only dependent on pressure.

$$(f_r - f_o) = 2f_o v (\cos\theta) / c$$

Doppler Frequency Shift Equation





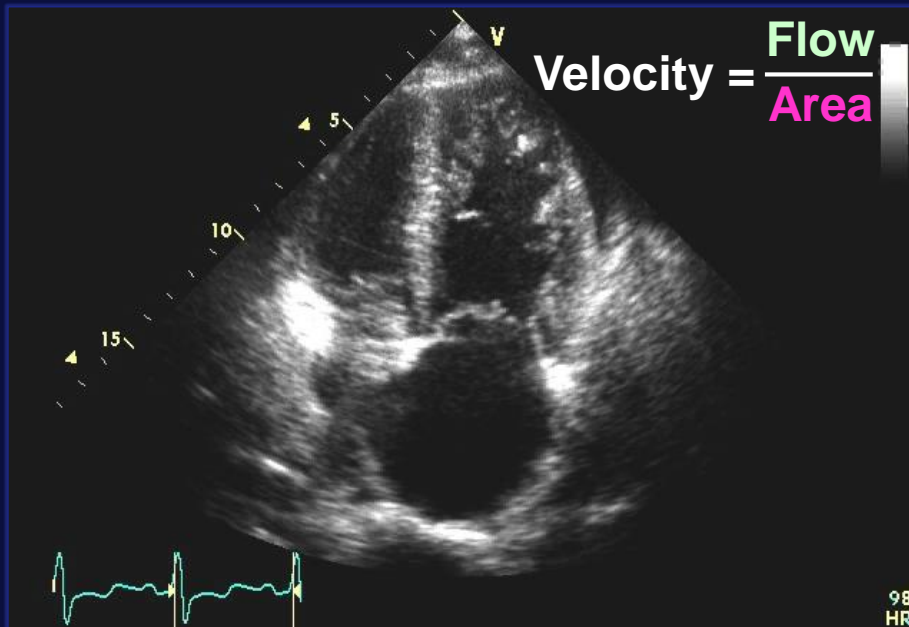
- If V1 is significant (>1.5 m/sec)
- Presence of anemia (viscous friction)

Estimate of RVSP and PASP Assumptions

1. Velocity is only dependent on pressure.

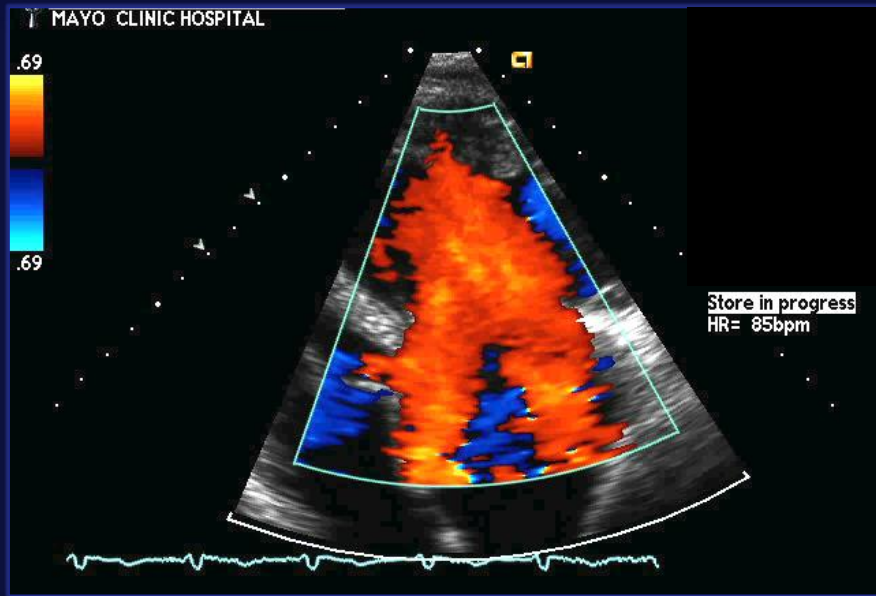
$$\text{Flow} = \text{Area} \times \text{Velocity}$$

 Heart Rate
  Contractility



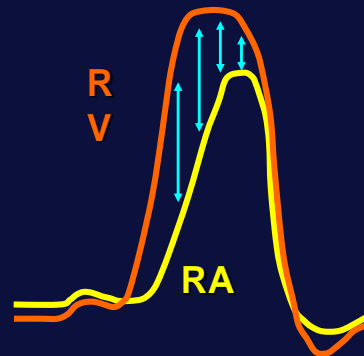
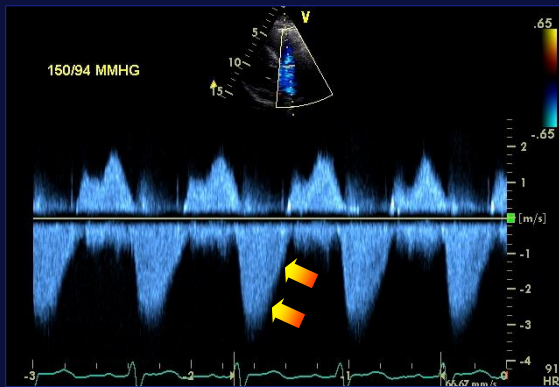
Estimate of RVSP and PASP Assumptions

1. Velocity is only dependent on pressure.
2. You can accurately estimate right atrial pressure.
 - Non simultaneous
 - Peak systole



Severe Tricuspid Regurgitation

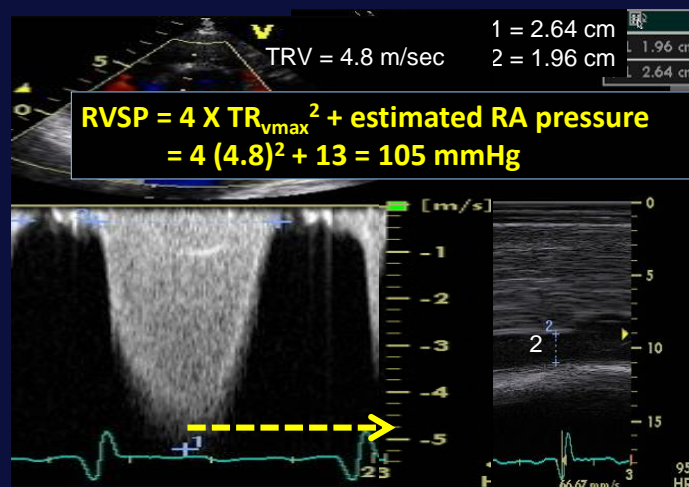
Systolic RV → RA pressure equalization



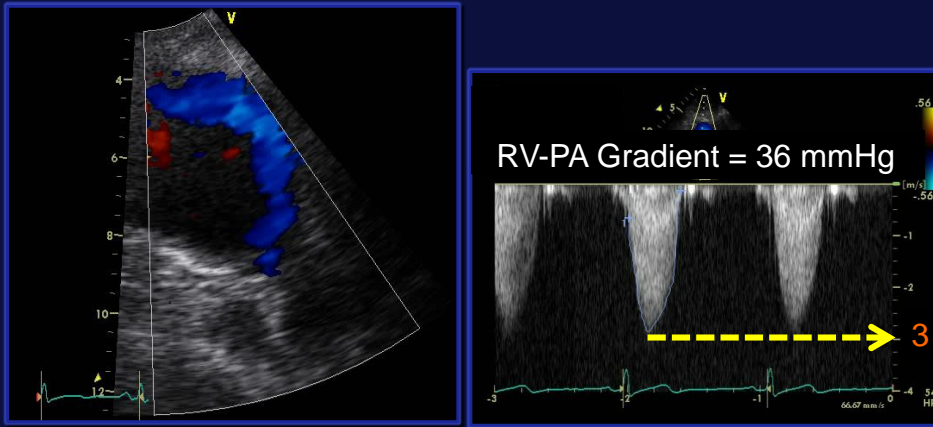
Estimate of RVSP and PASP Assumptions

1. Velocity is only dependent on pressure.
2. You can accurately estimate right atrial pressure.
3. Right ventricular systolic pressure = Pulmonary artery systolic pressure

What is the Right Ventricular Systolic Pressure?



Pulmonary Stenosis



$$\text{SPAP} = \text{RVSP} - \text{PV gradient} = 105 - 36 = 69 \text{ mmHg}$$

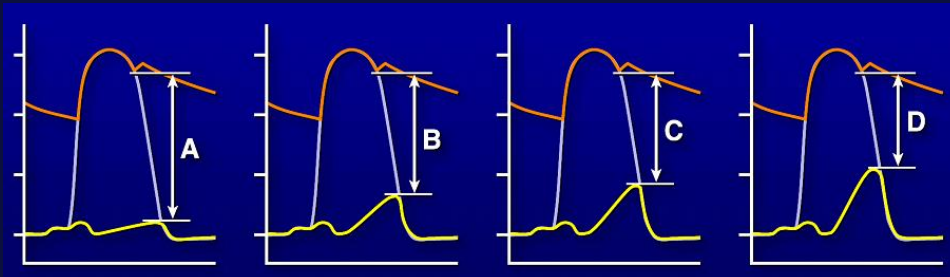
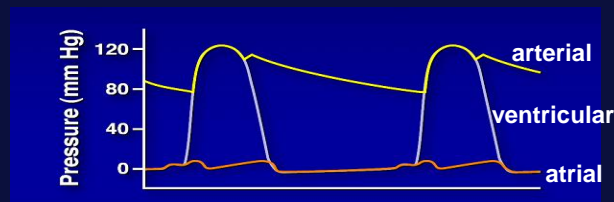
2. Women have smaller right ventricular end-diastolic volumes when compared to men. Also older age is associated with smaller volumes. Therefore, you would expect the right ventricular ejection fraction (RVEF) of older women compared to younger men to be?

- a) The RVEF would be the same in both the older women and younger men.
- b) The RVEF would be higher in older women compared to younger men**
- c) The RVEF would be lower in older women compared to younger men.

3. A 47 year old women has a dilated right ventricle with reduced right ventricular function along with signs and symptoms of right heart failure. The calculated right ventricular index of myocardial performance (RIMP) determined by pulsed wave Doppler was 0.64. She was treated with diuretics and clinically improved as her right atrial pressure decreased. You now re-calculate the RIMP and you would expect the value to?

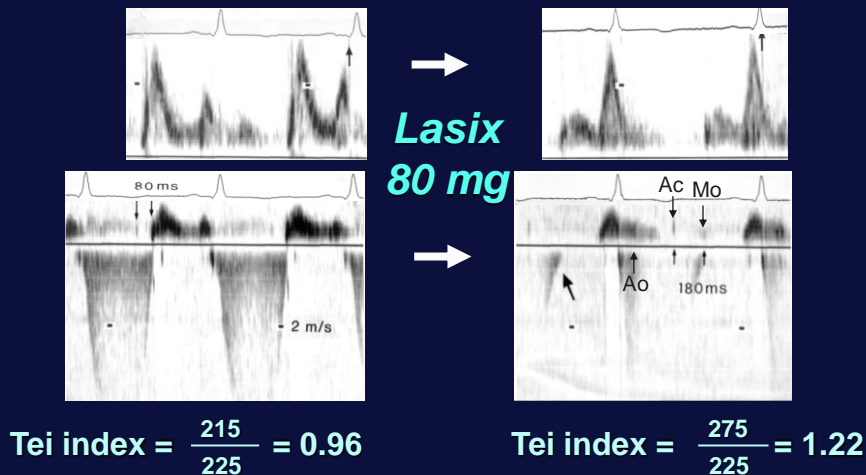
- a. Higher than prior to treatment with diuretics**
- b. Lower than prior to treatment with diuretics**
- c. Unchanged**

Change in Atrial Pressure



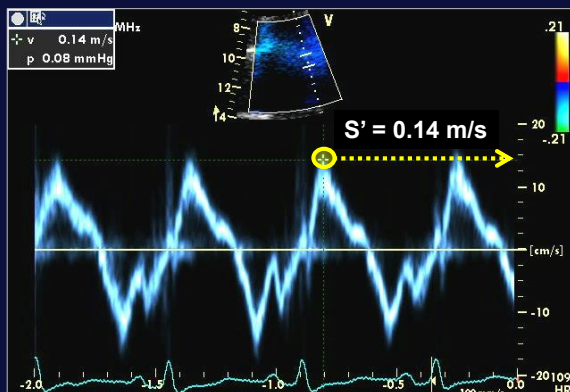
Index of Myocardial Performance

Effect of decrease in LA pressure



Courtesy Dr. Hatle

4. With respect to the S' velocity, an example shown below, the following statement is true.



- The S' velocity obtained by pulsed wave tissue Doppler will be lower than the S' velocity if obtained by color tissue Doppler.
- The S' velocity represents global right ventricular function.
- S' velocity will be reduced following open heart surgery.
- The value of S' is not angle dependent.

5. 3D methods with which to calculate right ventricular (RV) volumes and ejection fraction may be superior to 2D methods for the following reason.

- a.** 3D methods of calculating RV volumes and ejection fraction are less load dependent than 2D methods.
- b.** 3D methods of calculating RV volumes and ejection fraction are less dependent on image quality than 2D methods.
- c.** 3D but not 2D methods with which to calculate RV volumes and ejection fraction correlate with values obtained by MRI.
- d.** 3D methods include the RV outflow tract contribution to overall function while 2D methods do not.